

Real-time Estimation of UAS Performance Using Efficient Sampling of Functional Models, Phase I

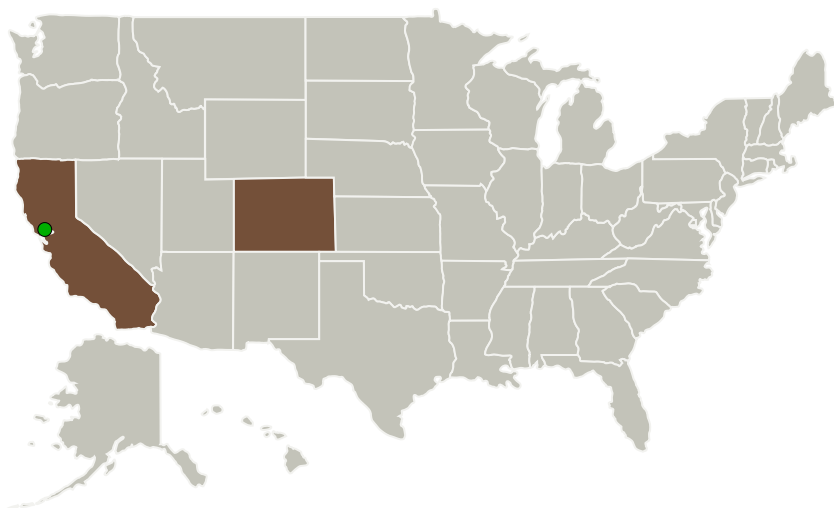
Completed Technology Project (2012 - 2012)



Project Introduction

Numerica proposes to develop advanced algorithms for constructing a UAS vehicle model from ATC surveillance data in real-time. Using functional descriptions of aircraft performance and computationally efficient sampling techniques, UAS model parameters are estimated, and aircraft maneuvers that best improve these estimates are determined. Numerica's approach has two important advantages. First it is agnostic to the specific structure of the aircraft performance model and can be used with a range of parameterized modeling techniques ranging from simplified "table look-up" models to physics-based kinetic models. This permits faster integration with current ATM systems since it leverages (rather than replaces) existing trajectory prediction techniques and databases. Second, the functional descriptions do not require that the models for propulsion or aerodynamic forces to adhere to a specific analytical form. This allows tremendous modeling flexibility and permits the inclusion of complicated atmospheric factors that may be relevant for trajectory prediction but are difficult to capture with simple closed-form expressions. Since the approach has solid theoretical foundations, the algorithms can be also used in an offline context to help establish bounds on the "best-possible" model estimation performance given the accuracy and character of available surveillance data. This capability could help in determining requirements on ATC sensors to enable reliable trajectory predictions for UAS that lack detailed performance models.

Primary U.S. Work Locations and Key Partners



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Organizations Performing Work	Role	Type	Location
Numerica Corporation	Lead Organization	Industry	Fort Collins, Colorado
● Ames Research Center(ARC)	Supporting Organization	NASA Center	Moffett Field, California

Primary U.S. Work Locations	
California	Colorado

Project Transitions

▶ **February 2012:** Project Start

✓ **August 2012:** Closed out

Closeout Documentation:

- Final Summary Chart(<https://techport.nasa.gov/file/138449>)

Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Organization:

Numerica Corporation

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

Project Management

Program Director:

Jason L Kessler

Program Manager:

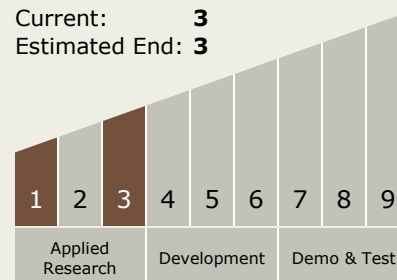
Carlos Torrez

Principal Investigator:

Jason Adaska

Technology Maturity (TRL)

Start: **1**
Current: **3**
Estimated End: **3**



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Technology Areas

Primary:

- TX15 Flight Vehicle Systems
 - └ TX15.2 Flight Mechanics
 - └ TX15.2.1 Trajectory Design and Analysis

Target Destinations

The Sun, Earth, The Moon, Mars, Others Inside the Solar System, Outside the Solar System